ABSTRACT

Laminates consisting of a high-damping core material sandwiched between two stiff, weldable skins. The laminate structures have increased resonant frequencies, improved damping characteristics, do not outgas, and may have a decreased inertial moment. The laminates are comprised of 100% metal constituents, and do not rely on epoxy or low-melting point solders. To make the laminate structures, a first alloyable metal is deposited on the surface of a dissimilar metal. The coated surface is then placed in contact with a second alloyable metal and allowed to interdiffuse at elevated temperatures. The metals are chosen such that diffusion creates an alloy with a melting point lower than either of the constituents. The processing temperature is set so that the alloy melts but leaves the base metals in solid form, causing a thin layer of liquid to form and wet both sides of the interface. External pressure is applied to the opposing base metals in such a way as to induce flow of the liquid layer and disrupt any oxide layers present on the surface of one or more of the base metals. Continued diffusion elevates the melting temperature of the liquid phase and causes it to solidify isothermally, creating a bond between the base metals. Highly polished surfaces on the base metals comprising the laminate structure are not required because the applied pressure causes the metal (in thin sheet form) to deform and create the intimate metal-metal contact necessary for diffusion. Moreover, the liquid flow helps to fill gaps between the parent materials and further mitigates the need for polished surfaces.